The Fruit of the Loam: The Benefits of Soil Conservation in Vietnam

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Soil loss is one of the most pressing and intractable environmental problems facing the developing countries of Southeast Asia. Now, however, new research from Vietnam has produced persuasive evidence that soil conservation makes economic sense for small-scale hill farmers and that, with the right support and training, these farmers can do much to preserve the region's soil resources and improve their own livelihoods. →

A summary of EEPSEA Research Report 2001-RR13, On-site Costs and Benefits of Soil Conservation in the Mountainous Regions of Northern Vietnam, by Tran Dinh Thao (Hanoi Agricultural University, Vietnam; contact: tdthao@netnam.org.vn)

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Soil conservation *improves farm productivity*

The research, by Tran Dinh Thao of Hanoi Agricultural University, looked at the on-farm costs of erosion and the economic benefits of soil conservation in the mountainous areas of North Vietnam. Thao also investigated the main factors that discourage farmers from practicing soil conservation.

He found that soil conservation improves productivity in hill farms. Despite this, many farmers are reluctant to adopt such techniques, because of problems such as labor costs and lack of expertise. To get more farmers involved in this vital work, Thao recommends that more must be done to support and train them in soil conservation techniques and so help them benefit from the productivity gains such techniques can bring.

Vietnam's Soil Crisis

Thao's research was carried out in response to Vietnam's critical soil loss problems. At the farm level, soil erosion causes crop yields to drop, which in turn reduces rural incomes. This has led to increased migration to urban areas and other regions. At the national level, soil erosion produces sediment and silt that can clog up irrigation channels and lower the water-storage capacity of dams, thus decreasing water supply and hydroelectric power productivity. Today almost all of the country's rivers are highly charged with silt: the Red River alone transports 0.6 billion m^3 of silt a year, the Mekong 1.5 billion m^3.

The magnitude of this problem is now attracting attention, but so far no evaluation has been made of the economic costs of soil erosion at a farm level. Thao focused on this aspect of the problem because he felt it was most important to show farmers – who must be the central players in any successful soil conservation campaign – the direct benefits they could gain from erosion control.

Thao's study focused on three villages: Hoason in Hoabinh province, Dongdang in Langson province and Ngocphai in Thainguyen province – areas typical of the northern mountainous region. This area has an average rainfall of 1,800 mm per year, with most rain falling from May to September. During this period, the region's soil – which has a light structure, poor fertility and low organic matter content – is most prone to erosion.

Soil Loss Statistics

To calculate the on-site cost of soil erosion in these villages, Thao analyzed the results of a seven-year experiment conducted by the National Institute of Soils and Fertilizers of Vietnam and Thainguyen University. This field research compared the performance of corn and cassava plots managed with three different soil conservation techniques and without any soil conservation at all. The conservation techniques were: a) alley cropping in which tea was grown in hedgerows between corn and cassava; b) planting *tephrosia candida* hedgerows on plot boundaries; and c) using tea and grass as hedgerows on plot boundaries. The study was run over seven years and recorded soil losses, plot yields, fertilizer and other inputs, and market prices for inputs and outputs in the three villages.

The results showed that soil erosion varied with the crops planted, the soil conservation practices used, and rainfall. Soil loss was highest in 1996 when rainfall was 1,943 mm. and lowest in 1998 when the rainfall was 684 mm. Soil loss was higher in cassava, partly because cassava is generally planted on more sloping land than corn.

Corn Yields With and Without Soil Conservation Measures (kg/ha)

Year	With	Without
1993	1,545	1,268
1994	1,440	917
1995	1,525	989
1996	1,290	663
1997	1,117	488
1998	1,164	503

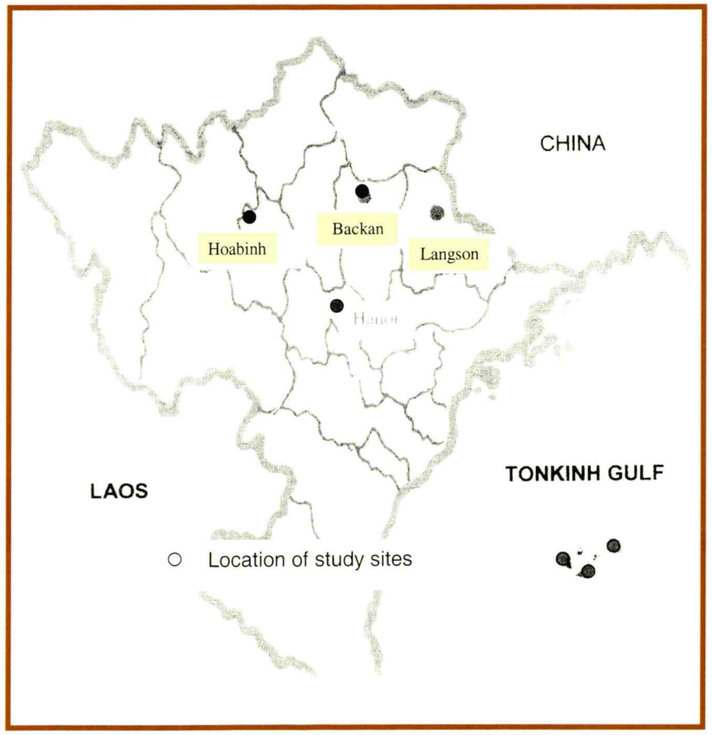
The best anti-erosion hedgerow species was found to be *tephrosia candida*. Using this plant, soil loss was only 84% of that experienced using tea hedges and only half of that experienced when no soil conservation was practiced.

Crop yield was found to be closely related to soil loss. In general, the seven-year study found that corn yields decreased from 1992 to 1998 in all plots. However, in plots where soil conservation had been practiced, yields decreased by only 5% a year; in plots without conservation, they decreased by an average of 17% annually. Overall, it was found that the corn yield was as much as 2.2 times higher on plots with conservation compared to plots without. The same trends were found for cassava.

The Benefits of Saving Soil

To identify and evaluate the costs and benefits of each soil conservation technique, Thao undertook a financial analysis of the different approaches based on the price of inputs and outputs. The results were expressed in terms of net present value (NPV). (NPV expresses costs and benefits occurring over time as a total value at one point in time.)

Thao found that corn yields were highest and labor costs lowest when *tephrosia candida* hedgerows were used. The NPV for this approach was 2.8 million VND per hectare with a lifespan of seven years. The tea hedgerow approach gave a higher return than that of *tephrosia candida* (due to the value of tea products), but material and labor costs were higher and the NPV per hectare was about the same. For cassava, the same trends were found, with the *tephrosia candida* technique having a high NPV of about 9 million VND per hectare.



Map of Northern Vietnam

Optimizing Benefits

The high productivity of the *tephrosia candida* technique was due to the fact that the soil became more fertile because organic matter from the hedgerows could be used as fertilizer. Thao found that most farmers who employed soil conservation techniques also used organic manure, unlike non-conservation farmers.

This finding indicated that yield differences between plots could be partly due to the more intensive use of fertilizers and not just to the implementation of soil conservation per se. In light of this, Thao decided to isolate the main factors affecting crop productivity, looking

at things like labor, fertilizer inputs and expenditure for materials for soil conservation. The results showed that although fertilizer and other inputs did have some effect, the implementation of soil conservation techniques was of overriding importance. The optimal level of soil conservation expenditure for corn production was 40 person-days of labor and 105,000 VND of materials per hectare.

Thao concluded that input efficiency is affected by soil conservation practices and that if farmers want to increase maize and cassava productivity on sloping land, they should invest in such practices. He also concluded that *tephrosia candida* is the best technique for poor farmers, given its high returns and low input costs.

Getting Farmers Involved

At the time of Thao's research, levels of soil conservation implementation among farmers in the survey villages were between 54% and 65%. Given the undoubted benefits of soil conservation, Thao interviewed farmers to find out why soil conservation was not practiced more widely. He tried to answer questions such as: How does the income of farmers affect their adoption of soil conservation techniques? How do credit, extension and training affect adoption? His analysis looked at factors such as farm size, family income and the education level of household heads.

Thao found that 38% of interviewed farmers said they did not want to invest in soil conservation because it was too difficult to maintain hedgerow lines when the main crops were harvested. A further 27% answered that soil conservation on steeply sloping land required too much labor, while 16% said they wanted to do soil conservation but didn't know how.

From this, Thao concluded that training should be provided about soil conservation practices; that the government should expand the activities of agricultural extension centers in northern Vietnam; and that they should supply credit and *tephrosia candida* seeds to farmers to kick-start soil conservation. Helping farmers over the initial hurdles could go a long way toward improving the sustainability of Vietnamese agriculture.

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